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ديناميكا حرارية - امتحان أول

P T U – Kadoorie **Course: Thermodynamics** **Date: 23-3-2011**	 13/25	**College of Engineering** **First Exam.** **Sec. Semester 2010-2011**

تم الرفع بواسطة م. معن أبو عيسى

Q1: In the following questions, select the correct answer from choices followed each question and put the answer in the answer sheet: **(10 marks)**

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1- In the fuel cell تحلل

(a)- Water analyzed to hydrogen and oxygen to produced electric power
b- Oxygen and hidrogen react to form water and produce electric power تتفاعل
c- Water analyzed to hydrogen and oxygen and consume electric power
d- Oxygen and hidrogen react to form water and consume electric power

2- In the SI system of units, the absolute temperature is measured in

(a)- Kelvin b- Degree Celsius c- Rankine d- Fahrenheit

3- A temperature change $\Delta T(K) = 15$ K. It's change in °C is

a- $\Delta T(°C) = 15$ °C (b)- $\Delta T(°C) = 288$ °C c- $\Delta T(°C) = 258$ °C d- $\Delta T(°C) = -15$ °C

4- The pressure in a chamber is 24 kpa gauge, the absolute pressure is (take $P_o = 100$ kpa) :

a- 24 kpa (b)- 124 kpa c- 76 kpa d- 100 kpa

5- The turbine in the thermal power plant change :

a- the electric power to mechanical energy b- the shaft power to electric energy
c- the thermal power to electric energy (d)- the pressure and thermal power to mechanical energy

6- The difference in height between the columns of a manometer is 100 mm with a fluid of density 900 kg/m^3, the pressure difference between its two ends is

(a)- 0.882 kpa b- 1.76 kpa 3- 4.5 kpa 4- 2.72 kpa

7- A 2-m^3 tank is filled with propane gas at room temperature 20 °C and pressure 100 kPa ,the mass in the tank is:

R = 665.6
V = 4.2517

a- 4.34 kg b- 53 kg c- 2.82 kg (d)- 3.618 kg

8- Two properties are dependent when the substance is at saturated state

(a)- temperature and specific volume b- specific volume and pressure c- temperature and pressure
d- pressure and quality

9- Sublimation is defined as

(a)- changing from solid phase to vapor phase directly b- changing from solid phase to liquid phase
c- changing from solid phase to another solid phase d- changing from liquid phase to vapor phase

10- One of the following is extensive property

(a)- density b- specific volume c- mass of substance d- solidification temperature

Q2: a- Complete the following table using thermodynamic tables: **(5 marks)**

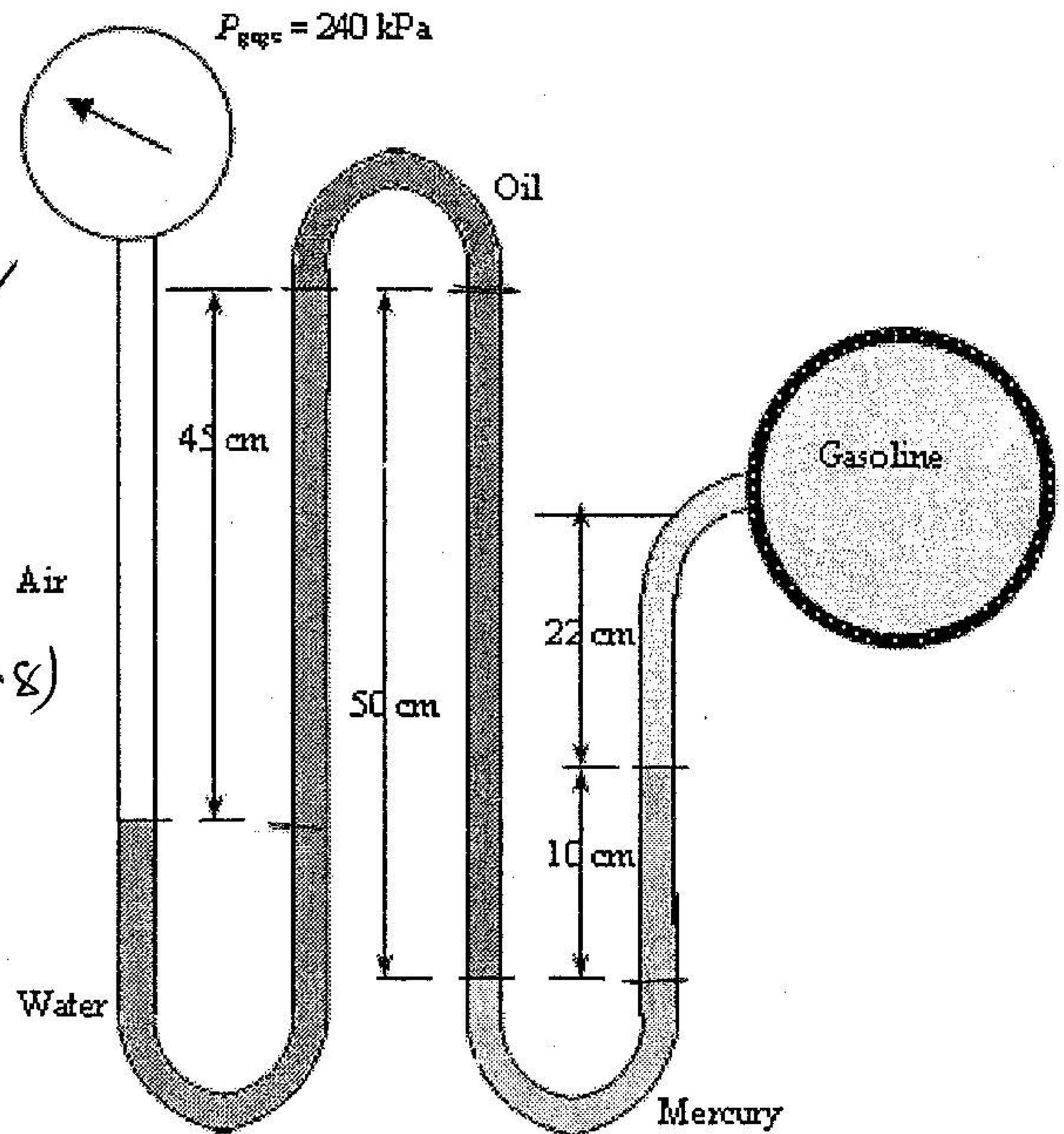
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substance	Tem. (°C)	Pressure (kpa)	Quality (x)	Specific. Volume (v)	Phase description
H_2O	180	1002.7	0.5125	0.10	Saturated mixture.
H_2O	250	1200	—	0.19235	Superheated vapor water
R-22	-10	250	—	0.09528	superheated R-22
Ammonia NH_3	15	800	—	0.183	Superheated Ammonia

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Q3- A gasoline line is connected to a pressure gage through a double-U manometer. For a 240 Kpa of the pressure gage, the gage pressure of the gasoline line is to be determined $\rho_{oil} = 800$ kg/m^3 , $\rho_{water} = 1000$ kg/m^3 , $\rho_{mer} = 13600$ kg/m^3 , $\rho_{gas} = 700$ kg/m^3 , g= 9.8 m/s^2.

(5 marks)



$P = 240$ kPa

$P_2 = P - \rho_{water} * 0.45 * 9.8 + \rho_{oil} * 0.5 * 9.8 + \rho_{mer} * 0.1 * 9.8$
$+ \rho_{gas} * 0.22 * 9.8$

(h, g written above the values)

$P_2 = 240 - (1000 * 0.45 * 9.8) + (800 * 0.5 * 9.8) + (13600 * 0.1 * 9.8)$
$+ (700 * 0.22 * 9.8)$

$P_2 = 240 - 4410 + 3920 + 13328 + 1509.2$

$P_2 = \frac{23407.2}{1000}$

$P_2 = 23.4072$ Kpa

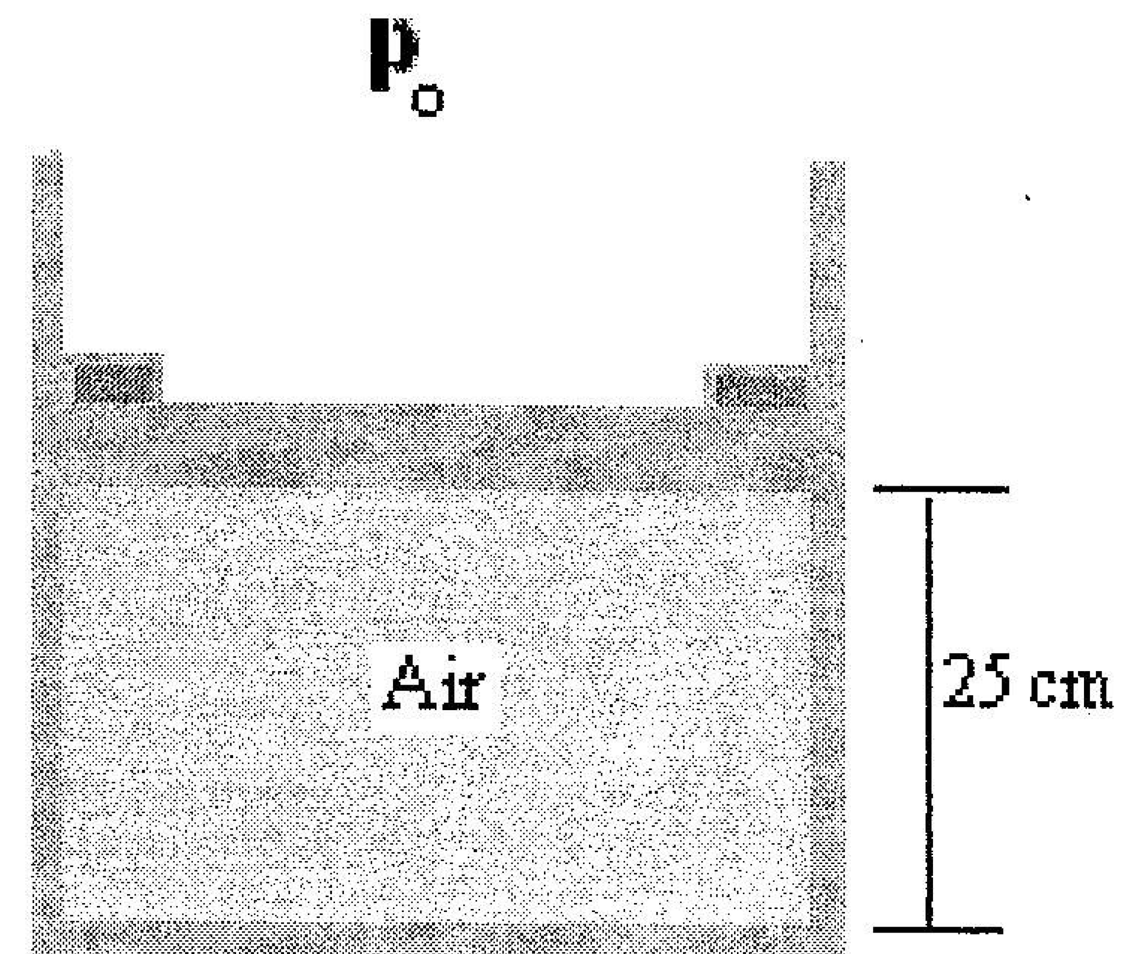
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Q4- A piston/cylinder arrangement, shown , contains air at 250 kPa, 300°C. The 50-kg piston has a diameter of 0.1 m and initially pushes against the stops. The atmosphere is at 100 kPa and 20°C. The cylinder now cools as heat is transferred to the ambient.

a. At what temperature does the piston begin to move down?

b. How far has the piston dropped when the temperature reaches ambient?

Assuming air is an ideal gas **(5 marks)**



$P = 250 kpa$

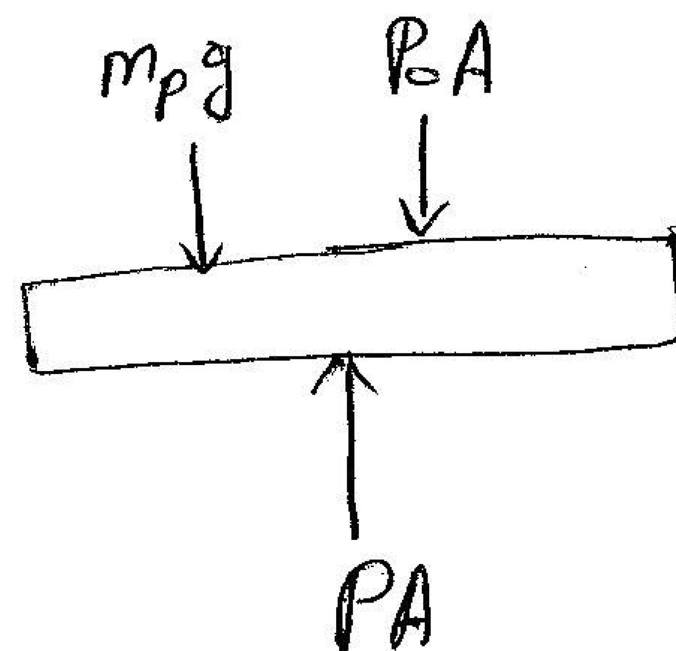
$T = 300 °C$

$M_p = 50 kg$

$D = 0.1 m$

$P_o = 100 kpa$

$T = 20 °C$



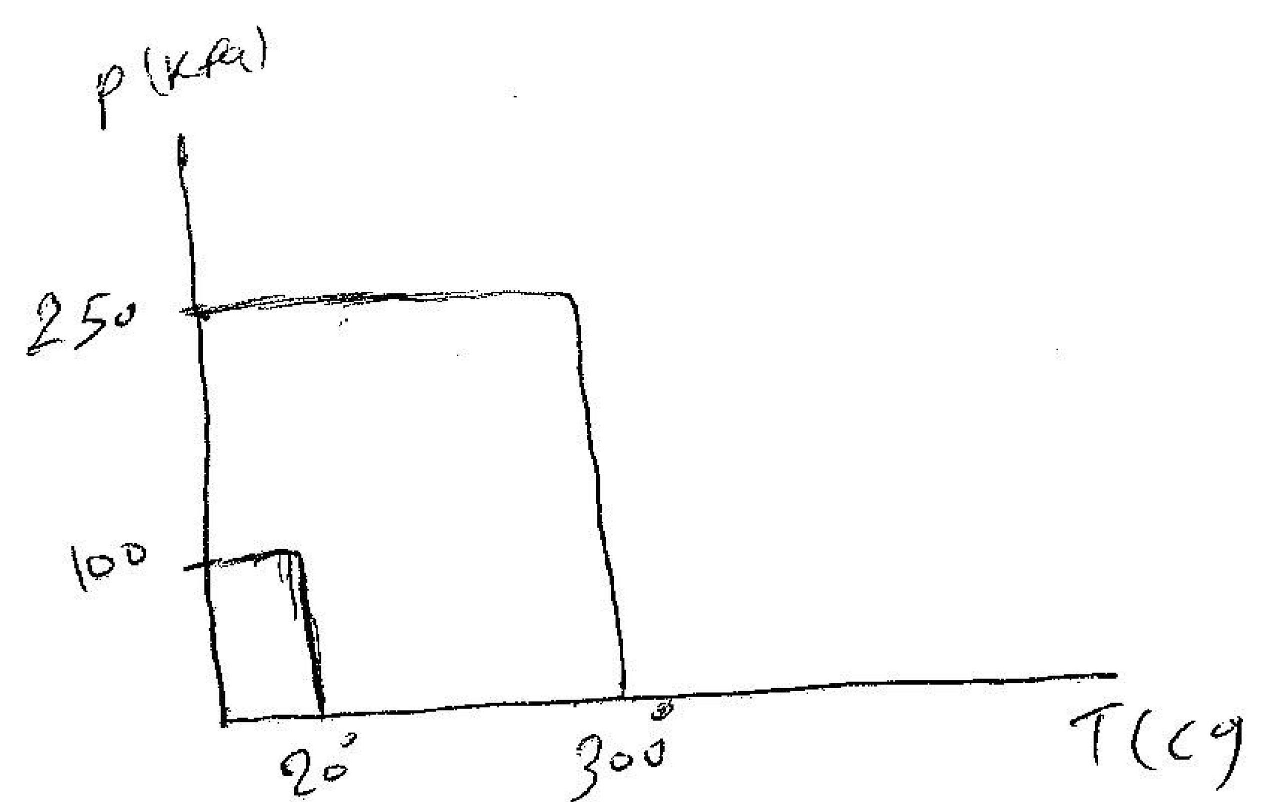
$P * A = m_p g + P_o A$

$\frac{250}{1000} * A = 50 * 9.8 + \frac{100}{1000} A$

$0.25A = 490 + 0.1A$

$0.15A = 490$

$A = 3266.66 \, m^2$



$P_2 A = m_p g + P_o A$